

THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY.

[SECOND SERIES.]

No. 92. AUGUST 1855.

VI.—Notes on Palæozoic Bivalved Entomostraca. No. I. Some Species of *Beyrichia* from the Upper Silurian Limestones of Scandinavia. By T. RUPERT JONES, F.G.S.

[With a Plate.]

AMONGST the small bivalved Entomostraca found in the Lower Palæozoic rocks are several species of the genus *Beyrichia*, for the elucidation of which we are chiefly indebted to MM. Klöden, Beyrich, M'Coy, and Salter. The *Beyrichie* occur very low down in the geologic series, though they are not the first to indicate the Crustacean class in the fossiliferous rocks.

The carapace-valves of these little Crustaceans are usually oblong in shape, and rarely exceed $\frac{1}{10}$ th of an inch in length; the more typical forms have their surfaces embossed with two, three, or more transverse ridges or isolated protuberances. Some specimens in their general contour and in the arrangement of the inequalities on the surface of the valve offer a distant resemblance to a miniature human ear. Other varieties have smooth valves, more or less indented by a transverse furrow which divides the surface into two unequal parts.

The remains of *Beyrichie* are met with, both as calcareous carapace-valves (by far most usually separate), and as casts of single valves, scattered more or less abundantly in the substance of the rock or on the planes of stratification. Not unfrequently they have been distorted by the movements which the integral parts of the rock have suffered in the process of partial metamorphism. The carapaces themselves, generally as single valves, are frequently met with in the Upper Silurian rocks of Britain, though not in the Lower Silurian; and they abound in some of the Upper Silurian rocks of Sweden. Yet our observations are often necessarily limited to the casts of the exteriors and the

moulds of the interiors of these minute valves. The substance of the valves being of the same thickness throughout, the internal casts represent with tolerable clearness the configuration of the exterior.

The Upper Silurian limestones of Gothland and the south of Sweden often abound in minute, symmetrical, semicircular, trilobed bodies, which are the heads and tails of little Trilobites of the genus *Agnostus* (particularly *A. pisiformis*). Together with these occur other somewhat similar trilobed forms, which however are smaller, longer in proportion, and not symmetrical. These are *Beyrichiæ*.

Drifted fragments of these fossiliferous Scandinavian limestones occur abundantly in the sands and gravels of Mecklenburg, Brandenburg, and Pomerania; and these blocks in their weathered condition have yielded plentiful supplies of fossils to the naturalists of North Germany. In 1769 C. F. Wilckens* figured specimens of *Agnostus pisiformis* from this source, referring them with doubt to Trilobites (and proposing the removal of Trilobites from amongst Mollusks to Insects). With these he also figures a *Beyrichia* † (*B. Wilckensiana*, nobis), from Havelberg, without however arriving at any conclusion as to its true nature.

L. von Buch in his 'Recueil de Planches de Pétrifications remarquables ‡,' pl. 6, figures some *Beyrichiæ* in a limestone block from near Güstrow in Mecklenburg, and regards them as the young of his *Leptæna lata*, a view quite incompatible with every character of these creatures, as M. Klöden has well explained in his 'Die Versteinerungen der Mark Brandenburg §.'

Klöden met with numerous specimens in weathered fragments of the Scandinavian limestone from the gravels near Berlin; and he has given carefully executed (but evidently not quite correct) figures of the valves of at least two species, in different stages of growth, accompanied with a detailed description ||. This observer remarked that these little fossils are not at all referable to the *Leptæna* which accompanies them, nor to any mollusk; and, guided by the apparently symmetrical, semicircular, three-lobed form of some of the specimens, he was led to regard them as being probably the cephalic and caudal portions of the carapace of small Trilobites, and to assign them to the genus *Battus* (= *Agnostus*), although he figures and describes the unsymmetrical contour and irregular distribution of the surface-lobes of

* Nachricht von seltenen Versteinerungen (8vo, Berlin), 1769, pl. 7. f. 38.

† *Op. cit.* p. 77. pl. 7. fig. 39. These specimens have been confounded by Dalman, Klöden, Burmeister, &c., with the foregoing.

‡ Fol. Berlin, 1831. These figures are too obscure for satisfactory recognition as to their specific relations.

§ Berlin, 8vo, 1834.

|| *Op. cit.* pp. 112-119.

other specimens, and even shows the actually bivalved condition of at least one example. This author refers all his specimens to one species, under the name of *Battus tuberculatus*.

In 1843 Burmeister (*Die Organiz. d. Trilobiten*, p. 72) refers M. Klöden's figures, without any assigned reason and certainly erroneously, to *Odontopleura ovata*.

In 1846, M'Coy, describing the Silurian fossils of Ireland*, pointed out the really unsymmetrical arrangement of the lobes and furrows on these little bodies; and, finding them to correspond in pairs of dextral and sinistral valves, he rightly conjectured them to be the bivalved carapaces of Entomostraca. For these animals he therefore established a new genus, "*Beyrichia*," named from M. Beyrich, who also, in a work then lately published†, had stated his belief that M. Klöden's specimens were not referable to any Trilobite, but to some small bivalved Crustacean.

In 1851‡ Prof. M'Coy further illustrated the genus, referring it to the family "*Limnadiadæ*," of the Phyllopod order of Entomostraca; and remarking that "several species of this genus have been figured and described by Klöden, as varieties of his *Battus tuberculatus*."

Mr. Salter also has illustrated and described some British species of this genus, in the *Memoirs of the Geological Survey of Great Britain*, vol. ii. part 1, and in Appendix A. of '*Descript. Brit. Pal. Foss.*' above referred to. There are a few other published notices of *Beyrichiæ*; but we now have to confine ourselves to an examination of the species from the Scandinavian limestone, postponing for the present the critical notice of other published species.

As M. Klöden's figures were nearly all that we had in this country for our guidance in the comparison of the *Beyrichiæ*, it was desirable that we should be able to test by the examination of good Scandinavian specimens the accuracy of these drawings and of the specific determinations that have been made by their help. Not long since Sir C. Lyell, when visiting Berlin, had the kindness to mention to Prof. Beyrich my desire to have an opportunity of examining some well-preserved specimens of M. Klöden's typical species; and a liberal supply of limestone fragments from the gravels of Prussia and Silesia, rich in *Beyrichiæ*, was most courteously granted by Prof. Beyrich and brought to England by Sir C. Lyell.

I now proceed to the results of the examination of these inter-

* Synopsis of the Silurian Fossils of Ireland (4to, Dublin), p. 57.

† Ueber Einige böhmische Trilobiten, p. 47.

‡ Description of Brit. Pal. Foss. in Sedgwick's Synopsis of the Classification of Brit. Pal. Rocks. 4to, Cambridge. Part II. Fasc. 1. p. 135.

esting specimens. They consist of five fragments of a bluish-gray limestone, full of organic remains; one of them from near Berlin, and the others from the neighbourhood of Breslau. (I shall refer to them as Nos. 1, 2, 3, 4, & 5, for the sake of convenience.) They differ somewhat among themselves in their lithological characters and in their organic contents; and no two of them contain exactly the same set of *Beyrichiæ*. Nos. 1, 2, & 4 have a weathered exterior of a whitish dun colour, in a more or less friable condition. On fracture this whitish external portion of the limestone exposes its fossils far more readily to the eye than the inner crystalline limestone does; and, indeed, the calcareous cement having been decomposed, the innumerable *Beyrichiæ* and other minute fossils start away in the breaking up of the mass, and may be readily picked out of the debris. Nos. 3 & 5 are rather darker in colour than the others, and have a rough concretionary structure. The weathered surface of these is not more friable than their interior, and the whole readily breaks up under the hammer, numbers of the little fossils becoming disengaged among the debris. All the fragments contain *Leptæna lata*. Nos. 1, 2, 3, & 4 are rich in this fossil, some of them contain fragments of heads of Trilobites, and No. 1 abounds with *Tentaculites* also. No. 5 is poorer in the *Leptæna*, &c., and contains Encrinital remains. Each of the limestones contains abundance of *Cytheres* or *Cytheropses*, the description of which is postponed for the present.

The relative distribution of these organic remains in each of the specimens is shown in the following Table:—

LIMESTONE SPECIMENS, Nos.	Near Berlin.		Near Breslau.		
	1.	2.	3.	4.	5.
<i>Beyrichia Buchiana</i> , n. sp.	***				
<i>B. tuberculata</i> , Klöd., sp.	***	***	
<i>Var. nuda</i>	***			
<i>Var. antiquata</i>	*
<i>B. Dalmaniana</i> , n. sp.	*		
<i>B. Maccoyiana</i> , n. sp.	*	*		
<i>B. Salteriana</i> , n. sp.	**
<i>B. Wilckensiana</i> , n. sp.	***	***	***
<i>Var. plicata</i>	**				
<i>B. siliqua</i>	*	
<i>B. fundula</i>	*	*	**
<i>Cytheres</i>	***	***	**	*	***
<i>Leptæna lata</i>	**	**	**	**	*
<i>Tentaculites</i>	*				
Encrinital remains	*

[The asterisks by their relative numbers denote the comparative abundance of the fossils.]

The several forms of the *Beyrichiæ* obtained from the limestone fragments are illustrated in Plate V., and I now proceed to their description (premising that the figures represent the specimens magnified 4 diameters).

Class CRUSTACEA.

Subclass ENTOMOSTRACA.

Order Phyllopoda ?

Family LIMNADIADÆ ?

Genus BEYRICHIA, M'Coy, 1846 (Synop. Sil. Fos. Ireland, p. 57).

Generic characters.—Animal enclosed in a vertical bivalved carapace. Carapace equivalved. Carapace-valves oblong; anterior (cephalic) and posterior (caudal) extremities somewhat rounded; inferior (ventral) border semicircular; superior (dorsal) border straight. Valves wider at the caudal than at the cephalic extremity; more or less convex; impressed with one or more transverse furrows, commencing on the dorsal or hinge border, and variously modifying the surface of the valve. Hingement not known; probably a simple adaptation of the thin dorsal edges and their union by membrane.

1st Group: SIMPLICES.—Surface of valve simple, almost uniformly convex, but impressed with one, usually short, vertical, dorsal furrow on the anterior half of the valve, and (if extended) dividing the surface of the valve into two unequal parts (the anterior portion being the smaller). Valves either with simple edges, or bordered (except on the dorsal edge) by a narrow flattened rim; in the first case the margin of the one slightly overlapping that of the other valve, when united; in the second case, the opposite flat borders coming in contact.

2nd Group: CORRUGATÆ.—Surface of valve convex, impressed with two vertical furrows, not reaching across the valve, but marking out three unequal lobes on the surface and giving it a *crumpled* appearance. The anterior furrow holds the same relative position as the single furrow in the "Simplices." The valves are bordered (on three sides) by a narrow depressed margin.

3rd Group: JUGOSÆ.—Surface of valve impressed with two or three strong vertical furrows, extending from the back to the ventral portion of the valve, and dividing the surface into three or more unsymmetrical lobes, transverse ridges, or bosses, which vary considerably in their size, mode of subdivision, and relative position in different species, and, to some extent, in different stages of growth of individuals. The anterior, inferior, and pos-

terior margins of each valve are turned sharply inwards, the angle so made being marked externally by a prominent ledge, either slightly rounded or trenchant (and sometimes spiny), forming a narrow depressed border along these three edges of the external surface of the valve. These edges of the valves close together by the marginal flange of the one valve being received within that of the other,—somewhat like the fitting of the lid and body of a circular snuff-box. United valves are very rare; one such specimen shows the ventral margin of the left valve overlapping that of the right. There is no marked difference in the shape of the two valves; and the size of the valve that is received within and overlapped by the other is very little less than that of its fellow.

(JUGOSÆ.)

1. *Beyrichia Buchiana*, nov. sp. Pl. V. figs. 1–3.

Surface of valve impressed with three transverse furrows; the anterior and central ones reaching across the valve, and separated by a narrow ridge; the posterior furrow extending about two-thirds of the width across, and bounded by a semicircular ridge. In other words, the exterior of the valve presents three transverse ridges; the anterior is isolated, narrow, and slightly curved; the other two, occupying the posterior half of the valve, are united towards the ventral border, and form a compressed semicircular or horse-shoe ridge, with its convexity downwards. The posterior arm of this horse-shoe-shaped ridge is larger than the other arm (or median ridge), and is sometimes indented by a slight, short, oblique furrow on its outer ridge (fig. 2); and sometimes it is tuberculated (fig. 3). The anterior and posterior margins of the valve are also roughened with spinose tubercles in old specimens.

This form presents a well-marked and simple pattern of the surface, to which we can conveniently refer for comparison in describing others. Only one of our limestone fragments affords this species, and in this it occurs in great profusion, together with *B. Wilckensiana*, *Tentaculites*, and *Leptæna lata*.

A very similar limestone appears to have furnished the specimens figured in the 'Recueil des Pétrif. Remarq.," and which indeed are possibly referable to this species:—a coincidence which has led me to dedicate this well-characterized *Beyrichia* to the memory of M. von Buch.

2. *Beyrichia tuberculata*, Klöden, sp. Pl. V. figs. 4–9.

Surface of valve embossed with three lobes or ridges. The anterior ridge is usually divided more or less decidedly by a

transverse furrow into two oval bosses of unequal size, the lower or ventral one being the largest and often becoming in the adult a protuberance of great (relative) size, and so prominent as to render the anterior part of the valve broader than the posterior (figs. 7 & 8). The central ridge is usually reduced to an oval boss, isolated and placed rather obliquely. The posterior or largest ridge is well developed, strongly curved, thick above and tapering downwards and forwards, until it terminates nearly opposite and near to the lower end of the central boss, with which it sometimes shows an inclination to unite at a sharp angle. At its thickest part, the posterior ridge is divided obliquely and transversely, by two, slight, narrow, sinuous furrows, into three parts, which vary in their distinctness in nearly every individual: sometimes a third similar furrow again divides this ridge in its ventral portion (fig. 8).

The surface of the valves is coarsely granulated, except in the very young state.

This species differs from *B. Buchiana* in its larger bulk, its coarser aspect, its granulations, and especially in the disposition of the surface-ridges. The same general arrangement of these exists in both species, but in *B. tuberculata* they have a greater development and are more subdivided; the horse-shoe ridge especially of the one is broken up in the other species.

This is evidently the species illustrated by Klöden's figures 20-23; and it is therefore the typical *Beyrichia tuberculata*. The other figures (16-19) referred by this author to the young state of the same species, belong to our new species *B. Wilckensiana*, to be presently described.

B. tuberculata, var. *nuda*. Pl. V. figs 10, 11.

A smaller-sized variety of this species occurs plentifully in another block of limestone. The surface is destitute of tubercles; and the ventral anterior lobe does not appear to attain the excessive growth that is seen in old specimens of the typical form.

B. tuberculata, var. *antiquata*. Pl. V. fig. 12.

A large and unique left carapace-valve, from No. 5 limestone, exhibiting the usual arrangement of the surface-lobes of this species, except that the posterior ridge is not quite so largely developed, has a perfectly smooth surface, and a trenchant margin well armed with spines on the front, hind, and lower borders of the valve. This spiny or denticulated condition of the margin I have not met with in other varieties of this species; but it occurs in two figures (20, 21) of M. Klöden's typical form.

3. *Beyrichia Dalmaniana*, nov. sp. Pl. V. fig. 13.

Anterior extremity of valve contracted, so as to give an almost triangular outline. Surface bearing five smooth rounded unequal protuberances or lobes; two obliquely placed anteriorly, two posteriorly, and one in the middle towards the dorsal border; the infero-posterior lobe is the largest. In the arrangement of these five lobes some reference to that of the ridges in the preceding species can be recognized, the two anterior lobes being the equivalents of the divided cephalic ridge in *B. tuberculata*; the posterior lobes representing the great caudal ridge, and the central lobe being isolated and similarly placed in both species. The narrow depressed border of the valve is slight but distinct. The surface is smooth, with traces of very fine linear punctations.

Only a right and a left valve were found (in No. 3. limestone).

I have distinguished this rare and curious little Scandinavian *Beyrichia* by the well-known name of one of the illustrious palæontologists of Sweden.

4. *Beyrichia Maccoyiana*, nov. sp. Pl. V. fig. 14.

Carapace-valve nearly semicircular; bearing three almost symmetrical rounded ridges. The anterior ridge broad, tapering downwards and backwards, and disunited at its termination from the others by a very slight depression. The middle ridge oval, united below with the posterior ridge, but constricted at the junction; the two forming a compressed horse-shoe ridge. Surface of valve punctate. The marginal depressed rim is broad, prominent, and trenchant, especially on the ventral margin, where it is marked by regularly placed, transverse, depressed lines or striæ equally on its upper and its under surface. This breadth of the ventral rim gives rise to the peculiar semicircular form of the valve.

The surface-lobes of this species have the arrangement of those in *B. Buchiana*; but, the furrows not being so deeply excavated, the ridges are fuller and less distinctly separate. The punctation of the surface and especially the well-developed and striated rim are the peculiar characteristics of this species.

B. Maccoyiana approaches some of Prof. Hall's* figures of *B. lata* (Vanuxem sp.), a *Beyrichia* from the Clinton rocks of the U.S.; but differences in the relative proportions of the ridges, and especially the broad rim, sufficiently separate the two forms.

Three specimens of left valves are all that I have found (one

* Palæontology of New York, vol. ii. pl. A. 66. fig. 10.

in No. 2. limestone, and two in No. 3.); and from their friable condition the carapace appears to have been of an unusually delicate structure.

This rare and interesting species is named after Prof. M'Coy, who founded the genus and devoted much labour to the elucidation of the species of this and other allied forms of palæozoic Entomostraca.

5. *Beyrichia Salteriana*, nov. sp. Pl. V. figs. 15, 16.

Valves narrow oblong; caudal portion wider than the cephalic; marginal rim of the anterior, inferior, and posterior borders uniform, well developed, and impressed with a series of shallow pits along the ventral portion. Surface finely punctate; divided into three unequal subtriangular convexities or lobes, separated by a very narrow forked or Y-shaped furrow. The posterior lobe is the largest; and the middle one, which is slightly in advance of the centre of the valve and is pushed up to the dorsal border, is the smallest.

This species offers a strong contrast to *B. Buchiana* in the width of the surface-lobes and the narrowness of the furrows; and it could scarcely answer to the name of "*jugosa*" or *ridged*, were it not that its system of furrows is equivalent to that of *B. tuberculata*, which is at the opposite extremity of this group.

This small, but elegant and well-characterized species is numerous in No. 5. limestone; and I dedicate it with much pleasure to my friend Mr. Salter, Palæontologist of the Geological Survey, to whom we are indebted for much information on the history of the Entomostraca of the Silurian rocks.

(CORRUGATÆ.)

6. *Beyrichia Wilckensiana*, nov. sp. Pl. V. figs. 17, 18.

Carapace-valves contracted anteriorly, almost reniform. Surface of valve smooth, highly convex, divided into three unequal lobes by two short furrows, the anterior of which is near the centre of the valve. The middle lobe, lying between the furrows, is rounded, prominent, projecting over the dorsal edge, and passes, by a narrow and sometimes constricted neck, into the convex body of the valve with which the front and hind lobes are continuous. The middle lobe, though prominent, is the smallest, and the anterior lobe is the widest, but depressed. The ventral part of the convex surface, where the lobes unite, hangs over the narrow flat rim of the inferior margin of the valve, and is separated from it by a deep wrinkle, which dies out

on the flattened margins of the anterior and posterior dorsal angles of the valve.

This form abounds in two of the limestones, and is evidently referred to in Klöden's figures 16-18; but it is still better figured by Wilckens, after whom I have named this peculiar species.

Beyrichia Wilckensiana, var. *plicata*. Pl. V. figs. 19-21.

In this variety the anterior dorsal angle is more acute, and the central lobe more compressed, than in the typical form; and the dorsal portions of the anterior and posterior lobes are marked by short faint vertical furrows, so as to appear pinched up into two or three small projecting angular ridges or plaits. The wrinkle or sulcus bounding the convex part of the valve is rather more strongly marked also.

This variety does not occur with the foregoing, but is plentiful in No. 1. limestone; and the specimens are usually smaller, though some individuals attain the full size of the type.

Possibly Klöden's figure 19. was taken from a specimen of this variety.

7. *Beyrichia siliqua*, nov. sp. Pl. V. fig. 22.

Carapace-valve elongate, contracted anteriorly; smooth; convex; divided into three unequal lobes by two shallow, rather oblique furrows crossing the convexity of the valve. Posterior lobe the largest. Marginal rim well developed on the ventral border.

Two dextral valves only in one of the limestones represent this well-marked species.

(SIMPLICES.)

8. *Beyrichia mundula*, nov. sp. Pl. V. fig. 23.

Carapace-valves varying from oblong to nearly oval, convex, smooth, punctated, and marked by a short distinct furrow near the middle of the upper part; the marginal depressed rim narrow and sometimes obscured on the ventral border by the convexity of that part of the valve.

This occurs in three of the limestones, and from its small size and general appearance is liable to be confounded with the numerous *Cythere*-like forms so common in these Scandinavian limestones. The specimens from No. 1. limestone are more oval and convex than the others; those from No. 5. are well preserved, and interesting from their oblong shape, depressed mar-

gins, slight sulcus, and trace of central "lucid spot;" in which characters we have a near approach to *Leperditia*.

B. mundula differs from *B. simplex*, Jones (Quart. Journ. Geol. Soc. vol. ix. p. 161. pl. 7. fig. 7), chiefly in its having a proportionally longer hinge-line, or dorsal border, and a narrower posterior extremity, and in frequently presenting a depressed *Leperditia*-like aspect of the valves, which we do not find in *B. simplex*.

The specimen here figured (fig. 23) is from the No. 1. limestone, and is very convex and broadly oval in shape. The dorsal border is, however, usually straight, two-thirds the length of the valves, and from each of its extremities the margin has an oblique direction downwards and outwards to about half the width of the valve, where it meets the semicircular ventral border, and so forms the more or less angular anterior and posterior extremities of the valve, the former of which is somewhat narrower and sharper than the latter. This outline, or an approximation to it, is traceable in very many of the *Beyrichiæ*, but it is best developed in the specimens of *B. mundula* above referred to, from No. 5. limestone, in which the obliquity of the antero-dorsal and the postero-dorsal angles of the carapace is as well marked as in *Leperditia*, and is combined with a general depression of the carapace-valves and other characteristics above-noticed, which indicate a close relationship to the last-named genus:—to this point we shall again refer in further descriptions of the species of these genera.

Of the three groups of the genus, that of the *Jugosæ* is well represented in the Scandinavian limestones under examination. To this group also belong—

- Beyrichia Klædeni*, M'Coy.
- *complicata*, Salter.
- *symmetrica*, Hall.
- *lata*, Vanuxem, sp.
- *Busacensis*, Jones.
- *Bohemica*, Barrande, MS.

The *Corrugatæ* have here only two representatives (*B. Wilkensisiana* and *B. siliqua*). Possibly Hall's *Cytherina spinosa* may be a *Beyrichia* of this type. An undescribed species from Busaco belongs to this group, and, taken together with *B. Bohemica*, affords a passage into *B. complicata* of the *Jugosæ* group.

The little *B. mundula* above described has many larger congeners among the *Simplices*, such as—

- Beyrichia simplex*, Jones,
- *Logani*, Jones, MS.
- *strangulata*, Salter,

and several Bohemian forms collected by M. Barrande.

EXPLANATION OF PLATE V.

[The figures represent the specimens magnified 4 diameters, with the exception of 16 *b*.]

- Fig. 1 *a*. *Beyrichia Buchiana*, Jones: right valve. 1 *b*. Ventral aspect of the same valve. 2. Left valve. 3. Left valve of old specimen.
- Fig. 4. *Beyrichia tuberculata*, Klöden, sp.: right valve (young individual). 5 *a*. Right valve. 5 *b*. Ventral aspect of the same valve. 6. Left valve. 7 *a*. Left valve (old individual). 7 *b*. Ventral aspect of the same valve. 8 *a*. Right valve. 8 *b*. Transverse section of the right valve. 9 *a*. Left valve. 9 *b*. Ventral aspect of the same valve.
- Fig. 10 *a*. *B. tuberculata*, var. *nuda*, Jones: right valve. 10 *b*. Ventral aspect of the same valve. 11. Left valve.
- Fig. 12. *B. tuberculata*, var. *antiquata*, Jones: left valve.
- Fig. 13 *a*. *Beyrichia Dalmaniana*, Jones: right valve. 13 *b*. Ventral aspect of the same valve.
- Fig. 14. *Beyrichia Maccoyiana*, Jones: right valve.
- Fig. 15 *a*. *Beyrichia Salteriana*, Jones: right valve. 15 *b*. Ventral aspect of the same valve. 16 *a*. Left valve. 16 *b*. Highly magnified view of part of the border.
- Fig. 17. *Beyrichia Wilckensiana*, Jones: Left valve. 18 *a*. Right valve. 18 *b*. Ventral aspect of the same valve.
- Fig. 19. *B. Wilckensiana*, var. *plicata*, Jones: right valve of large individual. 20 *a*. Right valve. 20 *b*. Ventral aspect of the same valve. 21. Left valve.
- Fig. 22. *Beyrichia siliqua*, Jones: right valve.
- Fig. 23. *Beyrichia mundula*, Jones: left valve.

VII.—On the Conjugation of the Diatomaceæ.

By J. W. GRIFFITH, M.D., F.L.S.

[With a Plate.]

THE interest attached to the conjugation and the relation of the forms to the species of Diatomaceæ, will, I trust, render the following remarks of interest to the botanist.

At the end of May of the present year, I was fortunate enough to find the bodies delineated in Pl. II. B. figs. 1–5, in a ditch near Blackwall.

The first which attracted my notice was that represented by fig. 3, and which could not be referred to any known Diatomacean; it was composed of siliceous matter, *i. e.* indestructible by heat and nitric acid. Upon further search, other of these bodies were found (fig. 2) containing a frustule of a *Navicula*, some also with the valves of another *Navicula* (figs. 1 & 2) adherent to the former. It was then evident that these bodies represented